REMARKS

I. Claim Amendments

Claims 1-8 and 11 are pending.

II. Specification Objection

The specification is amended to overcome the objection.

III. 35 USC §112, first paragraph

Claims 1, 9 and 10 have been combined to overcome the 35 USC 112, first paragraph rejection. Claim 1 is amended to recite the claim 9 feature of the anode having a top and a bottom and the anode being closer to the strip at the bottom than at the top. Claim 1 is amended to replace "generally parallel" with the term "substantially vertical" (consistent with the generally vertical language from Claim 10). The term "generally" in the context of the application has the same meaning as the term "substantially". The term "substantially vertical" is appropriate where, as here, one of ordinary skill in the art would know what was meant by it (See MPEP 2173.05(b).D). One of ordinary skill in the art would know "substantially vertical" encompasses vertical and close to vertical. An example of close to vertical is the embodiment of Fig. 6 in which the anode baskets, and hence the edge strips, are tilted to have the bottom portions of the anode basket front walls and edge strips closer to the facing moving strip than the top portions of the anode basket front walls and edge strips. As stated at page 3, Fig. 6 schematically indicates placement and appearance of an anode basket for use in the process of the present invention. Fig. 7 schematically indicates an anode basket for use in the process of the present invention in more detail. Thus, the Fig. 7 anode of may tilt consistent with Fig. 6.

Regarding Claim 6, the inventor at page 8, lines 13-18 discloses an overlap of 20 mm and states it was "varied" to 60 mm. Moreover, the invention includes adjustable edge masks. Thus, there is disclosure that the inventor had possession of an edge mask which could be adjusted from 30 to 60 mm. Thus, there is a range of 30 to 60 mm. If the Examiner is concerned that in a single run the overlap can vary from top to

bottom, Claim 6 has been amended to avoid that.

Claim 7 recites moving the edge masks to adjust lateral overlap from a distance from the plating line as disclosed at page 7, line 23. This meant their adjustment can be controlled remotely. Claim 7 is amended to make this clearer.

Claim 8 recites a remainder of space on the front wall between the moveable edge masks is open as shown by Fig. 7. This means it is not covered and directly faces the opposed moving strip with no obstruction between them as shown in Fig. 6. In other words, the open portion is "visible" from the opposed part of the strip (see page 1, lines 28-29). Claim 8 is amended to make this clearer.

Claim 10 is now combined with Claim 1. How its features do not violate 35 USC 112, first paragraph, is discussed above.

Applicant respectfully submits there is sufficient written description for Claim 11. When the anode of Fig. 7 is used in the apparatus of Fig. 6 then the strip's longitudinal axis inherently faces the open portion of the anode rather than the masked edges.

IV. 35 USC §112, second paragraph

The claims have been amended in response to this rejection.

Claim 8 had proper antecedent basis. The excerpt "the front wall between" is taken out of context. However, commas have been added to make this clearer.

V. 35 U.S.C. §103

A. Claims 1-2, 5-6 and 8 have been rejected unpatentable over Nachtman (US 1,991,817, hereinafter Nachtman) in combination with Botts et al. (US 5,776,327, hereinafter Botts).

Claims 1, 9 and 10 have been combined so this rejection is moot.

B. Claims 3 and 4 have been rejected as being unpatentable over Nachtman in combination with Botts and further in view of Schober (US 4,164,454).

Schober does not make up for the deficiencies of Nachtman and Botts. Moreover, the device claimed in Schober is very complicated and the anode baskets are virtually inaccessible during production.

C. Claims 9-11 have been rejected as being unpatentable over Nachtman in combination with Botts as applied to claims 1-2, 5-6 and 8 above, and further in view of Allen (US 2,719,820 hereinafter "Allen").

Nachtman has been cited as teaching a process for high speed metal strip electroplating of a moving strip comprising plating the metal strip (equated to a strip or ribbon of steel; page 1, lines 12-18) by tin anodes 38.

The Office action cites Botts because it recognizes Nachtman does not disclose the following claim 1 features:

(a) wherein the anodes are anodically dissolving tin anodes;

(b) wherein the depositing is depositing anodically dissolved tin from the tin anodes;

(c) wherein each anode comprises an anode basket; and

(d) wherein the tin of the tin anodes is supplied to the electroplating solution in the form of tin pellets held in each said anode basket.

Botts is said to teach electrolytic tinning (col. 2, lines 40-42, and col. 5, claims 1 and 5). Botts is said to teach tin is supplied to electroplating solution in the form of pellets (anode particles) held in an anode basket 10 (col. 2, lines 40-42, and col. 3, lines 43-63) wherein part of the tin anodes is masked out using adjustable masking means. Botts masks selected portions of an anode basket by covering the anode basket with a non-conductive frame, placing a plurality of non-conductive plates on the frame, and adjusting the position of each of the plurality of non-conductive plates on the frame to achieve a desired electric field distribution) (col. 2, line 65 to col. 3, line 3). Botts, Fig. 2 shows an embodiment of a mask 20.

The Office action asserts it would be obvious to one of ordinary skill in the art to modify the plating described by Nachtman, to have plating by anodically dissolving tin anodes, as taught in Botts wherein tin is supplied to the electroplating solution in the form of pellets held in an anode basket, and wherein part of the tin anodes is masked out using adjustable masking means because this would have altered the electric field to produce a uniform plating thickness across the entire workpiece as taught by Botts (col. 4, line 67 to col. 5, line 3)

This rejection is respectfully traversed.

Nachtman discloses a plating device with a horizontal plating cell (tank 33). To use this with the anode basket it would have to be modified into a vertical plating cell because in a horizontal cell the distance between the metal pellets and the strip to be plated would be dependent on the level of the pellets in the basket. In a vertical arrangement, the distance between the pellets and the strip is always the same because, when the level of the pellets drops, the distance between the pellets and the strip does not change. However, it is submitted replacing Nachtman's horizontal cell with a vertical cell defeats a purpose of Nachtman.

Nachtman, page 1, left column, lines 50-52 indicates Nachtman is taking steps to prevent twisting, swinging or coiling of the strip. While not expressly disclosed, it is submitted this is consistent with why Nachtman is using a horizontal process.

Also, Nachtman discloses a roller 34 at the entry to the cell and another roller 35 at the discharge end of the cell. Nachtman does not locate any rollers between copper rollers 34,35.

> The copper rollers, 34 and 35, are connected with the negative pole of a source of supply, 36, of electricity by a conductor, 37, and immersed in the electrolyte within the tank, 33, in the space between the copper rollers, 34 and 35, are bars, 38, of tin which being connected by a conductor, 39 with the positive pole of the source of current constitute the anodes. (Page 2, left column, lines 45-52).

In contrast, a vertical plating cell, such as in Allen (discussed further below), has a sink roll between its conductor rolls 14, 14.

Claim 1 differs from the combination of Nachtman and Botts by having the edge portions of the wall of the tin anodes which extend in the machine direction, masked out by adjustable masking means elongated generally parallel to the machine direction (substantially vertical). Nachtman does not disclose the tin anodes being baskets containing tin pellets, nor any masking. Botts is a batch-wise coating process (i.e., a continuously moving substrate to be coated is absent), wherein the non-conductive plates are masking means positioned transversely to the longitudinal edges of the objects to be coated. Masking means positioned in such a way would not prevent the

occurrence of dog bone formation on a continuously moving strip as is a goal of the present invention.

Moreover, Nachtman discloses in column 2, line 55 that the tin is applied to and made to adhere to all of the surfaces of the steel bars in an evenly distributed amount and in whatever thickness of film or plating may be desired. This means that the skilled person would have no incentive to modify Nachtman, and certainly would have no incentive to modify it with anode baskets, because that would result in a worse process as a result of the dropping pellet level over the course of time as a result of the horizontal arrangement.

There is no motivation to add the masks of Botts to the horizontal electroplating cell of Nachtman. The masks in Botts do not contribute to the removal of the dog bone, because they are mounted to be oriented perpendicularly relative to how the masks in the present invention are oriented. They would not change the field lines, only the intensity, and thereby only affect the overall thickness of the plating layer deposited, and not affect the distribution of the thickness over the width. This is the same with the masks cited in Delfrate (discussed below). They are the wrong way round, thus only affecting global thickness not thickness distribution.

The Office action cites Allen because it recognizes Nachtman does not disclose the following claim 1 features:

(a) wherein the anode has a top and a bottom and the anode is closer to the strip at the bottom than at the top (claim 9); or

(b) wherein the edge portions of the wall of the tin anodes are elongated generally vertically and the moveable edge masks are elongate generally vertically (claim 10).

Allen is cited for teaching electroplating a continuous strip S vertically through the electrolytic cell 10 (Fig. 1). Allen is also cited as teaching the anode 16 has a top and a bottom and the anode is closer to the strip at the bottom than at the top (Fig. 1).

The Office action it would be obvious to modify the edge portions and the moveable edge masks of the Nachtman and Botts combination to have the anode with top and bottom wherein the anode is closer to the strip at the bottom than at the top and

wherein the edge portions of the wall of the tin anodes are elongated generally vertically and the moveable edge masks are elongated generally vertically because "this is a conventional electrolytic cell configuration in the art of electroplating a moving metal strip with tin " as taught by Allen.

This assertion is respectfully traversed. As explained above, it is improper to replace the horizontal plating cell of Nachtman with the vertical plating cell of Allen.

Moreover, if the Nachtman horizontal cell is replaced by the Allen vertical cell, then it would be improper to employ the Botts anode basket with moveable non-metallic plates. In Allen the anode is closer to the strip at the bottom than at the top as supported at page 7, lines 12-13. Although Fig. 1 of Allen showed an inclined position, this inclined position is the opposite of Botts' teaching of a constant distance between the anode and the object in the height direction.

In regard to claim 11, Botts teaches open spaces between the moveable edge masks in Fig. 5. The Office action thus concludes the portions of the longitudinal axis of the moving strip facing the front wall would not oppose the moveable edge masks. This is incorrect. The plates 32 of Botts are transverse to the longitudinal direction of the opposed workpiece 5. Thus, assuming the improper combination proposed by the Office action, the plates 32 of Botts would be have to oppose the longitudinal axis of a moving strip substituted for the stationary workpiece.

It is also submitted that Nachtman and Allen cited the Office action are very old documents. This indicates a long felt need solved by the present invention as the art still uses anode bars as described in the prior art section in the present application

D. Claims 1-2 and 5-8 have been rejected as being unpatentable over Nachtman in combination with Kinghorn (US 5,454,929, hereinafter "Kinghorn") and Delfrate et al. (US 5,582,708, hereinafter "Delfrate").

Claims 1, 9 and 10 are combined so this rejection is moot.

E. Claims 3 and 4 have been rejected as being unpatentable over Nachtman in combination with Kinghorn and Delfrate as applied to claims 1-2 and 5-8, and further in view of Schober.

Schober does not make up for the deficiencies of Nachtman and Botts. Moreover, the device claimed in Schober is very complicated and the anode baskets are virtually inaccessible during production.

F. Claims 9-11 have been rejected as being unpatentable over Nachtman in combination with Kinghorn and Delfrate as applied to claim 1-2 and 5-8, and further in view of Allen.

Kinghorn is cited as teaching electroplating metal on a ribbon 30 (col. 7, lines16-23). Kinghorn teaches anodes 27 are typically wire screens or baskets. An anode basket is disclosed as generally being made of a titanium screen and it contains chunks of metal which will be deposited (Col. 6, line 61 to col. 7, line 2; also Fig. 4)

The Office action asserts it would be obvious to modify the tin bars arrangement in Nachtman with the missing features as disclosed in the anode basket of Kinghorn since this would be functionally and mechanically equivalent for electrotinning the moving strip or ribbon of steel in Nachtman.

It is respectfully submitted the anode basket of Kinghorn is not functionally and mechanically equivalent for electrotinning the moving strip or ribbon of steel in Nachtman. Kinghorn is about an entirely different type of product, and hardly relevant for tinplate production. Nachtman lays its substrate flat. Kinghorn orients substrate 30 upright. To reorient the Nachtman substrate to be upright would be not work with the equipment of Nachtman. This would also complicate Nachtman's goal of processing multiple strips in parallel (Nachtman, Page 1, left column, lines 32-37).

The emphasis in the present invention is (1) that the distance between strip and anode is always the same, thus when there are enough pellets in the basket, the plating behavior is constant, and (2) that the thickness of the tin layer is constant as a result of the edge masking, even when wider or narrower strip is used. To make sure there are always enough pellets in the basket, an automated system is desirable. Thus, flexibility, uniformity of thickness (no dog bone) and ease of process control (only the pellet level needs to be controlled) are the important advantages.

The Office action cites Delfrate for the limitation of the edge portions of the wall of the tin anodes elongated generally parallel to the direction of movement of the facing strip being masked out using adjustable masking means comprising moveable edge

masks elongated generally parallel to the direction of movement of the facing moving strip. The Office action asserts Delfrate teaches the active surface of each immersed anode is bordered on each of two opposite edges by a mask having, along the corresponding edge and in front of the running path, an electrically insulating surface closer to the running path than the edge (col. 1, line 62 to col. 2, line 17 and Fig. 1). transverse

Each panel shaped mask 4A, 4B of Delfrate extends along one corresponding edge 3A, 3B of the active surface of the anode 3 and is arranged in a plane approximately parallel to the strip running path (col. 3, lines 35-40).

The Office action has held it would be obvious to modify the anode basket of the Nachtman-Kinghorn combination with edge portions of the wall of the tin anodes elongated generally parallel to the direction of movement of the facing moving strip masked out using adjustable masking means comprising moveable edge masks elongated generally parallel to the direction of movement of the facing moving strip.

This assertion is respectfully traversed.

The Delfrate masks 4A, 4B are horizontally oriented transverse to the direction of movement of metal strip B. This is the opposite of the present invention. There is no teaching to arrange the masks and the direction of travel to be vertical as presently claimed. Allen does not make up for this deficiency.

Allen is cited as teaching electroplating a continuous strip, like in Nachtman, wherein the strip S is passed vertically through the electrolytic cell 10 (Fig. 1). In Allen the anode 16 has a top and a bottom and the anode is closer to the strip at the bottom than at the top, as shown in Fig. 1.

Applicant respectfully submits the Office action is picking and choosing from so many references with such different electroplating cells that Applicant is having a hard time understanding the final combination the Office action is proposing.

For example, the Office action replaces the Nachtman anode with the Kinghorn anode basket, but this forces the substrate to be upright and travel horizontally.

Then the Office action adds the edges 4A, 4B of Delfrate, but these are used in a system where the substrate lays flat and travels horizontally.

Then the Office action modifies the Kinghorn anodes with Allen to be closer to the moving substrate at the bottom than at the top of the anode. However, Allen's slanted anodes are illogical and inoperative to replace the horizontal Nachtman anodes, the upright Kinghorn anode baskets, or the horizontal Delfrate anodes. To modify the Kinghorn baskets to slant from top to bottom ignores that the baskets were selected by Kinghorn to operate in a flood plating chamber (see Kinghorn, col. 6, line 61-col. 7, line 22). Also, in Delfrate the distance between the upstream end of the anode and horizontally traveling strip B is the same as the distance between the downstream end of the anode and horizontally traveling strip B.

> "The two anodes 3 are each positioned between two immersed rollers and each has a plane active surface 13 placed beneath the strip running path and oriented parallel to it and towards it." (Delfrate, col. 3, lines 27-30).

Furthermore, even after all these combinations, the edges 4A, 4B are still oriented transverse to the direction of strip travel, rather than elongated vertically to be substantially parallel to the direction of strip travel as presently claimed.

Against Claims 8 and 11, Delfrate is again cited as teaching open spaces between the moveable edge masks (Fig. 1) and the longitudinal axis of the moving strip facing the front wall would not oppose the moveable edge masks.

Delfrate is irrelevant to Claim 8 which recites a remainder of space, on the front wall, between the moveable edge masks is open to directly oppose the moving strip, because the Delfrate edges are not oriented as are the edge masks of the present invention.

Moreover, Delfrate is irrelevant to Claim 11, which recites the longitudinal axis of the moving strip facing the front wall does not oppose the moveable edge masks, because by orienting the edges 4A, 4B transverse to the direction of strip travel, the edges 4A, 4B must oppose the longitudinal axis of the strip.

VI. Conclusion

In view of the above it is respectfully submitted all objections and rejections are overcome. Thus, a Notice of Allowance is respectfully requested.

Respectfully submitted,

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